

SEQUENCE LISTING

5 <110> Degussa AG

<120> Process for the preparation of L-threonine

10 <130> 030217BT

<160> 10

15 <170> PatentIn version 3.1

20 <210> 1
 <211> 993
 <212> DNA
 <213> Escherichia coli

25 <220>
 <221> CDS
 <222> (1)..(990)
 <223> rpoS gene

30 <400> 1

| | |
|---|-----|
| atg agt cag aat acg ctg aaa gtt cat gat tta aat gaa gat gcg gaa | 48 |
| Met Ser Gln Asn Thr Leu Lys Val His Asp Leu Asn Glu Asp Ala Glu | |
| 1 5 10 15 | |
| ttt gat gag aac gga gtt gag gtt ttt gac gaa aag gcc tta gta gaa | 96 |
| Phe Asp Glu Asn Gly Val Glu Val Phe Asp Glu Lys Ala Leu Val Glu | |
| 20 25 30 | |
| cag gaa ccc agt gat aac gat ttg gcc gaa gag gaa ctg tta tcg cag | 144 |
| Gln Glu Pro Ser Asp Asn Asp Leu Ala Glu Glu Glu Leu Leu Ser Gln | |
| 35 40 45 | |
| gga gcc aca cag cgt gtg ttg gac gcg act cag ctt tac ctt ggt gag | 192 |
| Gly Ala Thr Gln Arg Val Leu Asp Ala Thr Gln Leu Tyr Leu Gly Glu | |
| 50 55 60 | |
| att ggt tat tca cca ctg tta acg gcc gaa gaa gaa gtt tat ttt gcg | 240 |
| Ile Gly Tyr Ser Pro Leu Leu Thr Ala Glu Glu Glu Val Tyr Phe Ala | |
| 65 70 75 80 | |
| cgt cgc gca ctg cgt gga gat gtc gcc tct cgc cgc cgg atg atc gag | 288 |
| Arg Arg Ala Leu Arg Gly Asp Val Ala Ser Arg Arg Arg Met Ile Glu | |
| 85 90 95 | |
| agt aac ttg cgt ctg gtg gta aaa att gcc cgc cgt tat ggc aat cgt | 336 |
| Ser Asn Leu Arg Leu Val Val Lys Ile Ala Arg Arg Tyr Gly Asn Arg | |
| 100 105 110 | |

60

| | | |
|----|---|-----|
| | ggt ctg gcg ttg ctg gac ctt atc gaa gag ggc aac ctg ggg ctg atc | 384 |
| | Gly Leu Ala Leu Leu Asp Leu Ile Glu Glu Gly Asn Leu Gly Leu Ile | |
| | 115 120 125 | |
| 5 | cgc gcg gta gag aag ttt gac ccg gaa cgt ggt ttc cgc ttc tca aca | 432 |
| | Arg Ala Val Glu Lys Phe Asp Pro Glu Arg Gly Phe Arg Phe Ser Thr | |
| | 130 135 140 | |
| 10 | tac gca acc tgg tgg att cgc cag acg att gaa cgg gcg att atg aac | 480 |
| | Tyr Ala Thr Trp Trp Ile Arg Gln Thr Ile Glu Arg Ala Ile Met Asn | |
| | 145 150 155 160 | |
| 15 | caa acc cgt act att cgt ttg ccg att cac atc gta aag gag ctg aac | 528 |
| | Gln Thr Arg Thr Ile Arg Leu Pro Ile His Ile Val Lys Glu Leu Asn | |
| | 165 170 175 | |
| 20 | gtt tac ctg cga acc gca cgt gag ttg tcc cat aag ctg gac cat gaa | 576 |
| | Val Tyr Leu Arg Thr Ala Arg Glu Leu Ser His Lys Leu Asp His Glu | |
| | 180 185 190 | |
| 25 | cca agt gcg gaa gag atc gca gag caa ctg gat aag cca gtt gat gac | 624 |
| | Pro Ser Ala Glu Glu Ile Ala Glu Gln Leu Asp Lys Pro Val Asp Asp | |
| | 195 200 205 | |
| 30 | gtc agc cgt atg ctt cgt ctt aac gag cgc att acc tcg gta gac acc | 672 |
| | Val Ser Arg Met Leu Arg Leu Asn Glu Arg Ile Thr Ser Val Asp Thr | |
| | 210 215 220 | |
| 35 | ccg ctg ggt ggt gat tcc gaa aaa gcg ttg ctg gac atc ctg gcc gat | 720 |
| | Pro Leu Gly Gly Asp Ser Glu Lys Ala Leu Leu Asp Ile Leu Ala Asp | |
| | 225 230 235 240 | |
| 40 | gaa aaa gag aac ggt ccg gaa gat acc acg caa gat gac gat atg aag | 768 |
| | Glu Lys Glu Asn Gly Pro Glu Asp Thr Thr Gln Asp Asp Asp Met Lys | |
| | 245 250 255 | |
| 45 | cag agc atc gtc aaa tgg ctg ttc gag ctg aac gcc aaa cag cgt gaa | 816 |
| | Gln Ser Ile Val Lys Trp Leu Phe Glu Leu Asn Ala Lys Gln Arg Glu | |
| | 260 265 270 | |
| 50 | gtg ctg gca cgt cga ttc ggt ttg ctg ggg tac gaa gcg gca aca ctg | 864 |
| | Val Leu Ala Arg Arg Phe Gly Leu Leu Gly Tyr Glu Ala Ala Thr Leu | |
| | 275 280 285 | |
| 55 | gaa gat gta ggt cgt gaa att ggc ctc acc cgt gaa cgt gtt cgc cag | 912 |
| | Glu Asp Val Gly Arg Glu Ile Gly Leu Thr Arg Glu Arg Val Arg Gln | |
| | 290 295 300 | |
| 60 | att cag gtt gaa ggc ctg cgc cgt ttg cgc gaa atc ctg caa acg cag | 960 |
| | Ile Gln Val Glu Gly Leu Arg Arg Leu Arg Glu Ile Leu Gln Thr Gln | |
| | 305 310 315 320 | |
| 65 | ggg ctg aat atc gaa gcg ctg ttc cgc gag taa | 993 |
| | Gly Leu Asn Ile Glu Ala Leu Phe Arg Glu | |
| | 325 330 | |
| | <210> 2 | |
| | <211> 330 | |
| | <212> PRT | |
| | <213> Escherichia coli | |

<400> 2
 Met Ser Gln Asn Thr Leu Lys Val His Asp Leu Asn Glu Asp Ala Glu
 1 5 10 15
 5 Phe Asp Glu Asn Gly Val Glu Val Phe Asp Glu Lys Ala Leu Val Glu
 20 25 30
 Gln Glu Pro Ser Asp Asn Asp Leu Ala Glu Glu Glu Leu Leu Ser Gln
 35 40 45
 10 Gly Ala Thr Gln Arg Val Leu Asp Ala Thr Gln Leu Tyr Leu Gly Glu
 50 55 60
 15 Ile Gly Tyr Ser Pro Leu Leu Thr Ala Glu Glu Glu Val Tyr Phe Ala
 65 70 75 80
 Arg Arg Ala Leu Arg Gly Asp Val Ala Ser Arg Arg Arg Met Ile Glu
 85 90 95
 20 Ser Asn Leu Arg Leu Val Val Lys Ile Ala Arg Arg Tyr Gly Asn Arg
 100 105 110
 Gly Leu Ala Leu Leu Asp Leu Ile Glu Glu Gly Asn Leu Gly Leu Ile
 115 120 125
 25 Arg Ala Val Glu Lys Phe Asp Pro Glu Arg Gly Phe Arg Phe Ser Thr
 130 135 140
 30 Tyr Ala Thr Trp Trp Ile Arg Gln Thr Ile Glu Arg Ala Ile Met Asn
 145 150 155 160
 Gln Thr Arg Thr Ile Arg Leu Pro Ile His Ile Val Lys Glu Leu Asn
 165 170 175
 35 Val Tyr Leu Arg Thr Ala Arg Glu Leu Ser His Lys Leu Asp His Glu
 180 185 190
 Pro Ser Ala Glu Glu Ile Ala Glu Gln Leu Asp Lys Pro Val Asp Asp
 195 200 205
 40 Val Ser Arg Met Leu Arg Leu Asn Glu Arg Ile Thr Ser Val Asp Thr
 210 215 220
 45 Pro Leu Gly Gly Asp Ser Glu Lys Ala Leu Leu Asp Ile Leu Ala Asp
 225 230 235 240
 Glu Lys Glu Asn Gly Pro Glu Asp Thr Thr Gln Asp Asp Asp Met Lys
 245 250 255
 50 Gln Ser Ile Val Lys Trp Leu Phe Glu Leu Asn Ala Lys Gln Arg Glu
 260 265 270
 Val Leu Ala Arg Arg Phe Gly Leu Leu Gly Tyr Glu Ala Ala Thr Leu
 275 280 285
 55 Glu Asp Val Gly Arg Glu Ile Gly Leu Thr Arg Glu Arg Val Arg Gln
 290 295 300
 60 Ile Gln Val Glu Gly Leu Arg Arg Leu Arg Glu Ile Leu Gln Thr Gln
 305 310 315 320

• 16 •

4

Gly Leu Asn Ile Glu Ala Leu Phe Arg Glu
325 330

```

5  <210> 3
   <211> 993
   <212> DNA
   <213> Escherichia coli

```

```
10    <220>
      <221> Allele
      <222> (1)..(990)
      <223> rpoS allele
```

```
15      <220>
      <221> misc_feature
      <222> (97)..(99)
      <223> amber codon
```

| | | | | | | | | | |
|----|-------------|-------------|------------|------------|------------|------------|--|-----|--|
| 20 | <400> 3 | | | | | | | | |
| | atgagtcaga | atacgcgtgaa | agttcatgat | ttaaataaag | atgcggaatt | tgatgagaac | | 60 | |
| 25 | ggagttgagg | tttttgacga | aaaggcctta | gtagaatagg | aaccagtgga | taacgatttg | | 120 | |
| | gccgaagagg | aactgttata | gcagggagcc | acacagcgtg | tgttgagcgc | gactcagctt | | 180 | |
| | taccttggtg | agattgggtta | ttcaccactg | ttaacggccg | aagaagaagt | ttattttgcg | | 240 | |
| 30 | cgtcgcgcac | tgcgtggaga | tgtcgcctct | cgccgccgga | tgatcgagag | taacttgcgt | | 300 | |
| | ctggtggtaa | aaattgcccc | cgttatggc | aatcgtggtc | tggcgttgct | ggaccttata | | 360 | |
| 35 | gaagagggca | acctggggct | gatccgcgcg | gtagagaagt | ttgacctgga | acgtggtttc | | 420 | |
| | cgcttctcaa | catacgcaac | ctggtggatt | cgccagacga | ttgaacgggc | gattatgaac | | 480 | |
| | caaaccgta | ctattcgttt | gccgattcac | atcgtaaagg | agctgaacgt | ttacctgcga | | 540 | |
| 40 | accgcacgtg | agttgtccca | taagctggac | catgaaccaa | gtcgcgaaga | gatcgagag | | 600 | |
| | caactggata | agccagttga | tgacgtcagc | cgtatgcttc | gtcttaacga | gcgcattacc | | 660 | |
| 45 | tcggtagaca | ccccgctggg | tggtgattcc | gaaaaagcgt | tgctggacat | cctggccgat | | 720 | |
| | gaaaaagaga | acggtccgga | agataccacg | caagatgacg | atatgaagca | gagcatcgtc | | 780 | |
| | aatggctgt | tcgagctgaa | cgccaaacag | cgtgaagtgc | tggcacgtcg | attcggtttg | | 840 | |
| 50 | ctgggggtacg | aagcggcaac | actggaagat | gtaggtcgtg | aaattggcct | caccctgtaa | | 900 | |
| | cgtgttcgcc | agattcaggt | tgaaggcctg | cgccgtttgc | gcgaaatcct | gcaaacgcag | | 960 | |
| 55 | gggctgaata | tcgaagcgct | gttccgcgag | taa | | | | 993 | |

| | | |
|----|-------|------------------|
| | <210> | 4 |
| | <211> | 75 |
| | <212> | DNA |
| 60 | <213> | Escherichia coli |

<220>
 <221> tRNA
 <222> (1)..(75)
 <223> supE allele

5

<400> 4
 tgggggtatcg ccaagcggta aggcaccgga ttctaattcc ggcattccga ggttcgaatc 60

10 ctcgtagcccc agcca 75

<210> 5
 <211> 1545
 <212> DNA
 <213> Escherichia coli

15

<220>
 <221> CDS
 <222> (1)..(1542)
 <223> ilvA gene

20

<400> 5
 atg gct gac tcg caa ccc ctg tcc ggt gct ccg gaa ggt gcc gaa tat 48
 Met Ala Asp Ser Gln Pro Leu Ser Gly Ala Pro Glu Gly Ala Glu Tyr
 1 5 10 15

25

tta aga gca gtg ctg cgc gcg ccg gtt tac gag gcg gcg cag gtt acg 96
 Leu Arg Ala Val Leu Arg Ala Pro Val Tyr Glu Ala Ala Gln Val Thr
 20 25 30

30

ccg cta caa aaa atg gaa aaa ctg tcg tcg cgt ctt gat aac gtc att 144
 Pro Leu Gln Lys Met Glu Lys Leu Ser Ser Arg Leu Asp Asn Val Ile
 35 40 45

35

ctg gtg aag cgc gaa gat cgc cag cca gtg cac agc ttt aag ctg cgc 192
 Leu Val Lys Arg Glu Asp Arg Gln Pro Val His Ser Phe Lys Leu Arg
 50 55 60

40

ggc gca tac gcc atg atg gcg ggc ctg acg gaa gaa cag aaa gcg cac 240
 Gly Ala Tyr Ala Met Met Ala Gly Leu Thr Glu Glu Gln Lys Ala His
 65 70 75 80

45

ggc gtg atc act gct tct gcg ggt aac cac gcg cag ggc gtc gcg ttt 288
 Gly Val Ile Thr Ala Ser Ala Gly Asn His Ala Gln Gly Val Ala Phe
 85 90 95

50

tct tct gcg cgg tta ggc gtg aag gcc ctg atc gtt atg cca acc gcc 336
 Ser Ser Ala Arg Leu Gly Val Lys Ala Leu Ile Val Met Pro Thr Ala
 100 105 110

55

acc gcc gac atc aaa gtc gac gcg gtg cgc ggc ttc ggc ggc gaa gtg 384
 Thr Ala Asp Ile Lys Val Asp Ala Val Arg Gly Phe Gly Gly Glu Val
 115 120 125

ctg ctc cac ggc gcg aac ttt gat gaa gcg aaa gcc aaa gcg atc gaa 432
 Leu Leu His Gly Ala Asn Phe Asp Glu Ala Lys Ala Lys Ala Ile Glu
 130 135 140

60

ctg tca cag cag cag ggg ttc acc tgg gtg ccg ccg ttc gac cat ccg 480
 Leu Ser Gln Gln Gln Gly Phe Thr Trp Val Pro Pro Phe Asp His Pro
 145 150 155 160

| | | |
|----|---|------|
| | atg gtg att gcc ggg caa ggc acg ctg gcg ctg gaa ctg ctc cag cag | 528 |
| | Met Val Ile Ala Gly Gln Gly Thr Leu Ala Leu Glu Leu Leu Gln Gln | |
| | 165 170 175 | |
| 5 | gac gcc cat ctc gac cgc gta ttt gtg cca gtc ggc ggc ggc ggt ctg | 576 |
| | Asp Ala His Leu Asp Arg Val Phe Val Pro Val Gly Gly Gly Gly Leu | |
| | 180 185 190 | |
| 10 | gct gct ggc gtg gcg gtg ctg atc aaa caa ctg atg ccg caa atc aaa | 624 |
| | Ala Ala Gly Val Ala Val Leu Ile Lys Gln Leu Met Pro Gln Ile Lys | |
| | 195 200 205 | |
| 15 | gtg atc gcc gta gaa gcg gaa gac tcc gcc tgc ctg aaa gca gcg ctg | 672 |
| | Val Ile Ala Val Glu Ala Glu Asp Ser Ala Cys Leu Lys Ala Ala Leu | |
| | 210 215 220 | |
| 20 | gat gcg ggt cat ccg gtt gat ctg ccg cgc gta ggg cta ttt gct gaa | 720 |
| | Asp Ala Gly His Pro Val Asp Leu Pro Arg Val Gly Leu Phe Ala Glu | |
| | 225 230 235 240 | |
| 25 | ggc gta gcg gta aaa cgc atc ggt gac gaa acc ttc cgt tta tgc cag | 768 |
| | Gly Val Ala Val Lys Arg Ile Gly Asp Glu Thr Phe Arg Leu Cys Gln | |
| | 245 250 255 | |
| 30 | gag tat ctc gac gac atc atc acc gtc gat agc gat gcg atc tgt gcg | 816 |
| | Glu Tyr Leu Asp Asp Ile Ile Thr Val Asp Ser Asp Ala Ile Cys Ala | |
| | 260 265 270 | |
| 35 | gcg atg aag gat tta ttc gaa gat gtg cgc gcg gtg gcg gaa ccc tct | 864 |
| | Ala Met Lys Asp Leu Phe Glu Asp Val Arg Ala Val Ala Glu Pro Ser | |
| | 275 280 285 | |
| 40 | ggc gcg ctg gcg ctg gcg gga atg aaa aaa tat atc gcc ctg cac aac | 912 |
| | Gly Ala Leu Ala Leu Ala Gly Met Lys Lys Tyr Ile Ala Leu His Asn | |
| | 290 295 300 | |
| 45 | att cgc ggc gaa cgg ctg gcg cat att ctt tcc ggt gcc aac gtg aac | 960 |
| | Ile Arg Gly Glu Arg Leu Ala His Ile Leu Ser Gly Ala Asn Val Asn | |
| | 305 310 315 320 | |
| 50 | ttc cac gcc ctg cgc tac gtc tca gaa cgc tgc gaa ctg ggc gaa cag | 1008 |
| | Phe His Gly Leu Arg Tyr Val Ser Glu Arg Cys Glu Leu Gly Glu Gln | |
| | 325 330 335 | |
| 55 | cgt gaa gcg ttg ttg gcg gtg acc att ccg gaa gaa aaa ggc agc ttc | 1056 |
| | Arg Glu Ala Leu Leu Ala Val Thr Ile Pro Glu Glu Lys Gly Ser Phe | |
| | 340 345 350 | |
| 60 | ctc aaa ttc tgc caa ctg ctt ggc ggc cgt tcg gtc acc gag ttc aac | 1104 |
| | Leu Lys Phe Cys Gln Leu Leu Gly Gly Arg Ser Val Thr Glu Phe Asn | |
| | 355 360 365 | |
| 65 | tac cgt ttt gcc gat gcc aaa aac gcc tgc atc ttt gtc ggt gtg cgc | 1152 |
| | Tyr Arg Phe Ala Asp Ala Lys Asn Ala Cys Ile Phe Val Gly Val Arg | |
| | 370 375 380 | |
| 70 | ctg agc cgc ggc ctc gaa gag cgc aaa gaa att ttg cag atg ctc aac | 1200 |
| | Leu Ser Arg Gly Leu Glu Glu Arg Lys Glu Ile Leu Gln Met Leu Asn | |
| | 385 390 395 400 | |

| | | |
|----|---|------|
| | gac ggc ggc tac agc gtg gtt gat ctc tcc gac gac gaa atg gcg aag | 1248 |
| | Asp Gly Gly Tyr Ser Val Val Asp Leu Ser Asp Asp Glu Met Ala Lys | |
| | 405 410 415 | |
| 5 | cta cac gtg cgc tat atg gtc ggc gga cgt cca tcg cat ccg ttg cag | 1296 |
| | Leu His Val Arg Tyr Met Val Gly Gly Arg Pro Ser His Pro Leu Gln | |
| | 420 425 430 | |
| 10 | gaa cgc ctc tac agc ttc gaa ttc ccg gaa tca ccg ggc gcg ctg ctg | 1344 |
| | Glu Arg Leu Tyr Ser Phe Glu Phe Pro Glu Ser Pro Gly Ala Leu Leu | |
| | 435 440 445 | |
| 15 | cgc ttc ctc aac acg ctg ggt acg tac tgg aac att tct ttg ttc cac | 1392 |
| | Arg Phe Leu Asn Thr Leu Gly Thr Tyr Trp Asn Ile Ser Leu Phe His | |
| | 450 455 460 | |
| 20 | tat cgc agc cat ggc acc gac tac ggg cgc gta ctg gcg gcg ttc gaa | 1440 |
| | Tyr Arg Ser His Gly Thr Asp Tyr Gly Arg Val Leu Ala Ala Phe Glu | |
| | 465 470 475 480 | |
| 25 | ctt ggc gac cat gaa ccg gat ttc gaa acc cgg ctg aat gag ctg ggc | 1488 |
| | Leu Gly Asp His Glu Pro Asp Phe Glu Thr Arg Leu Asn Glu Leu Gly | |
| | 485 490 495 | |
| 30 | tac gat tgc cac gac gaa acc aat aac ccg gcg ttc agg ttc ttt ttg | 1536 |
| | Tyr Asp Cys His Asp Glu Thr Asn Asn Pro Ala Phe Arg Phe Phe Leu | |
| | 500 505 510 | |
| 35 | gcg ggt tag | 1545 |
| | Ala Gly | |
| | <210> 6 | |
| | <211> 514 | |
| | <212> PRT | |
| | <213> Escherichia coli | |
| 40 | <400> 6 | |
| | Met Ala Asp Ser Gln Pro Leu Ser Gly Ala Pro Glu Gly Ala Glu Tyr | |
| | 1 5 10 15 | |
| 45 | Leu Arg Ala Val Leu Arg Ala Pro Val Tyr Glu Ala Ala Gln Val Thr | |
| | 20 25 30 | |
| 50 | Pro Leu Gln Lys Met Glu Lys Leu Ser Ser Arg Leu Asp Asn Val Ile | |
| | 35 40 45 | |
| 55 | Leu Val Lys Arg Glu Asp Arg Gln Pro Val His Ser Phe Lys Leu Arg | |
| | 50 55 60 | |
| 60 | Gly Ala Tyr Ala Met Met Ala Gly Leu Thr Glu Glu Gln Lys Ala His | |
| | 65 70 75 80 | |
| 65 | Gly Val Ile Thr Ala Ser Ala Gly Asn His Ala Gln Gly Val Ala Phe | |
| | 85 90 95 | |
| 70 | Ser Ser Ala Arg Leu Gly Val Lys Ala Leu Ile Val Met Pro Thr Ala | |
| | 100 105 110 | |
| 75 | Thr Ala Asp Ile Lys Val Asp Ala Val Arg Gly Phe Gly Gly Glu Val | |
| | 115 120 125 | |

| | | | | | | | | | | | | | | | | |
|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| | Leu | Leu | His | Gly | Ala | Asn | Phe | Asp | Glu | Ala | Lys | Ala | Lys | Ala | Ile | Glu |
| | 130 | | | | | | 135 | | | | | 140 | | | | |
| 5 | Leu | Ser | Gln | Gln | Gln | Gly | Phe | Thr | Trp | Val | Pro | Pro | Phe | Asp | His | Pro |
| | 145 | | | | | 150 | | | | | 155 | | | | | 160 |
| | Met | Val | Ile | Ala | Gly | Gln | Gly | Thr | Leu | Ala | Leu | Glu | Leu | Leu | Gln | Gln |
| 10 | | | | | 165 | | | | | 170 | | | | | 175 | |
| | Asp | Ala | His | Leu | Asp | Arg | Val | Phe | Val | Pro | Val | Gly | Gly | Gly | Gly | Leu |
| | | | | 180 | | | | | 185 | | | | | 190 | | |
| 15 | Ala | Ala | Gly | Val | Ala | Val | Leu | Ile | Lys | Gln | Leu | Met | Pro | Gln | Ile | Lys |
| | | | 195 | | | | | 200 | | | | | 205 | | | |
| | Val | Ile | Ala | Val | Glu | Ala | Glu | Asp | Ser | Ala | Cys | Leu | Lys | Ala | Ala | Leu |
| | 210 | | | | | | 215 | | | | | 220 | | | | |
| 20 | Asp | Ala | Gly | His | Pro | Val | Asp | Leu | Pro | Arg | Val | Gly | Leu | Phe | Ala | Glu |
| | 225 | | | | | 230 | | | | | 235 | | | | | 240 |
| | Gly | Val | Ala | Val | Lys | Arg | Ile | Gly | Asp | Glu | Thr | Phe | Arg | Leu | Cys | Gln |
| 25 | | | | | 245 | | | | | 250 | | | | | 255 | |
| | Glu | Tyr | Leu | Asp | Asp | Ile | Ile | Thr | Val | Asp | Ser | Asp | Ala | Ile | Cys | Ala |
| | | | | 260 | | | | | 265 | | | | | 270 | | |
| 30 | Ala | Met | Lys | Asp | Leu | Phe | Glu | Asp | Val | Arg | Ala | Val | Ala | Glu | Pro | Ser |
| | | | 275 | | | | | 280 | | | | | 285 | | | |
| | Gly | Ala | Leu | Ala | Leu | Ala | Gly | Met | Lys | Lys | Tyr | Ile | Ala | Leu | His | Asn |
| | 290 | | | | | | 295 | | | | | 300 | | | | |
| 35 | Ile | Arg | Gly | Glu | Arg | Leu | Ala | His | Ile | Leu | Ser | Gly | Ala | Asn | Val | Asn |
| | 305 | | | | | 310 | | | | | 315 | | | | | 320 |
| | Phe | His | Gly | Leu | Arg | Tyr | Val | Ser | Glu | Arg | Cys | Glu | Leu | Gly | Glu | Gln |
| 40 | | | | | 325 | | | | | 330 | | | | | 335 | |
| | Arg | Glu | Ala | Leu | Leu | Ala | Val | Thr | Ile | Pro | Glu | Glu | Lys | Gly | Ser | Phe |
| | | | | 340 | | | | | 345 | | | | | 350 | | |
| 45 | Leu | Lys | Phe | Cys | Gln | Leu | Leu | Gly | Gly | Arg | Ser | Val | Thr | Glu | Phe | Asn |
| | | | 355 | | | | | 360 | | | | | 365 | | | |
| | Tyr | Arg | Phe | Ala | Asp | Ala | Lys | Asn | Ala | Cys | Ile | Phe | Val | Gly | Val | Arg |
| | 370 | | | | | | 375 | | | | | 380 | | | | |
| 50 | Leu | Ser | Arg | Gly | Leu | Glu | Glu | Arg | Lys | Glu | Ile | Leu | Gln | Met | Leu | Asn |
| | 385 | | | | | 390 | | | | | 395 | | | | | 400 |
| | Asp | Gly | Gly | Tyr | Ser | Val | Val | Asp | Leu | Ser | Asp | Asp | Glu | Met | Ala | Lys |
| 55 | | | | | 405 | | | | 410 | | | | | 415 | | |
| | Leu | His | Val | Arg | Tyr | Met | Val | Gly | Gly | Arg | Pro | Ser | His | Pro | Leu | Gln |
| | | | | 420 | | | | 425 | | | | | | 430 | | |
| 60 | Glu | Arg | Leu | Tyr | Ser | Phe | Glu | Phe | Pro | Glu | Ser | Pro | Gly | Ala | Leu | Leu |
| | | | 435 | | | | | 440 | | | | | 445 | | | |

| | | |
|----|---|-----|
| | Arg Phe Leu Asn Thr Leu Gly Thr Tyr Trp Asn Ile Ser Leu Phe His | |
| | 450 455 460 | |
| 5 | Tyr Arg Ser His Gly Thr Asp Tyr Gly Arg Val Leu Ala Ala Phe Glu | |
| | 465 470 475 480 | |
| | Leu Gly Asp His Glu Pro Asp Phe Glu Thr Arg Leu Asn Glu Leu Gly | |
| | 485 490 495 | |
| 10 | Tyr Asp Cys His Asp Glu Thr Asn Asn Pro Ala Phe Arg Phe Phe Leu | |
| | 500 505 510 | |
| | Ala Gly | |
| 15 | <210> 7 | |
| | <211> 1545 | |
| | <212> DNA | |
| | <213> Escherichia coli | |
| 20 | <220> | |
| | <221> CDS | |
| | <222> (1)..(1542) | |
| 25 | <223> ilvA allele | |
| | <220> | |
| | <221> mutation | |
| 30 | <222> (856)..(856) | |
| | <223> | |
| | <400> 7 | |
| 35 | atg gct gac tcg caa ccc ctg tcc ggt gct ccg gaa ggt gcc gaa tat | 48 |
| | Met Ala Asp Ser Gln Pro Leu Ser Gly Ala Pro Glu Gly Ala Glu Tyr | |
| | 1 5 10 15 | |
| 40 | tta aga gca gtg ctg cgc gcg ccg gtt tac gag gcg gcg cag gtt acg | 96 |
| | Leu Arg Ala Val Leu Arg Ala Pro Val Tyr Glu Ala Ala Gln Val Thr | |
| | 20 25 30 | |
| 45 | ccg cta caa aaa atg gaa aaa ctg tcg tcg cgt ctt gat aac gtc att | 144 |
| | Pro Leu Gln Lys Met Glu Lys Leu Ser Ser Arg Leu Asp Asn Val Ile | |
| | 35 40 45 | |
| 50 | ctg gtg aag cgc gaa gat cgc cag cca gtg cac agc ttt aag ctg cgc | 192 |
| | Leu Val Lys Arg Glu Asp Arg Gln Pro Val His Ser Phe Lys Leu Arg | |
| | 50 55 60 | |
| 55 | ggc gca tac gcc atg atg gcg ggc ctg acg gaa gaa cag aaa gcg cac | 240 |
| | Gly Ala Tyr Ala Met Met Ala Gly Leu Thr Glu Glu Gln Lys Ala His | |
| | 65 70 75 80 | |
| 60 | ggc gtg atc act gct tct gcg ggt aac cac gcg cag ggc gtc gcg ttt | 288 |
| | Gly Val Ile Thr Ala Ser Ala Gly Asn His Ala Gln Gly Val Ala Phe | |
| | 85 90 95 | |
| 60 | tct tct gcg cgg tta ggc gtg aag gcc ctg atc gtt atg cca acc gcc | 336 |
| | Ser Ser Ala Arg Leu Gly Val Lys Ala Leu Ile Val Met Pro Thr Ala | |
| | 100 105 110 | |

| | | |
|----|---|------|
| | acc gcc gac atc aaa gtc gac gcg gtg cgc ggc ttc ggc ggc gaa gtg | 384 |
| | Thr Ala Asp Ile Lys Val Asp Ala Val Arg Gly Phe Gly Gly Glu Val | |
| | 115 120 125 | |
| 5 | ctg ctc cac ggc gcg aac ttt gat gaa gcg aaa gcc aaa gcg atc gaa | 432 |
| | Leu Leu His Gly Ala Asn Phe Asp Glu Ala Lys Ala Lys Ala Ile Glu | |
| | 130 135 140 | |
| 10 | ctg tca cag cag cag ggg ttc acc tgg gtg ccg ccg ttc gac cat ccg | 480 |
| | Leu Ser Gln Gln Gln Gly Phe Thr Trp Val Pro Pro Phe Asp His Pro | |
| | 145 150 155 160 | |
| 15 | atg gtg att gcc ggg caa ggc acg ctg gcg ctg gaa ctg ctc cag cag | 528 |
| | Met Val Ile Ala Gly Gln Gly Thr Leu Ala Leu Glu Leu Leu Gln Gln | |
| | 165 170 175 | |
| 20 | gac gcc cat ctc gac cgc gta ttt gtg cca gtc ggc ggc ggc ggt ctg | 576 |
| | Asp Ala His Leu Asp Arg Val Phe Val Pro Val Gly Gly Gly Gly Leu | |
| | 180 185 190 | |
| 25 | gct gct ggc gtg gcg gtg ctg atc aaa caa ctg atg ccg caa atc aaa | 624 |
| | Ala Ala Gly Val Ala Val Leu Ile Lys Gln Leu Met Pro Gln Ile Lys | |
| | 195 200 205 | |
| 30 | gtg atc gcc gta gaa gcg gaa gac tcc gcc tgc ctg aaa gca gcg ctg | 672 |
| | Val Ile Ala Val Glu Ala Glu Asp Ser Ala Cys Leu Lys Ala Ala Leu | |
| | 210 215 220 | |
| 35 | gat gcg ggt cat ccg gtt gat ctg ccg cgc gta ggg cta ttt gct gaa | 720 |
| | Asp Ala Gly His Pro Val Asp Leu Pro Arg Val Gly Leu Phe Ala Glu | |
| | 225 230 235 240 | |
| 40 | ggc gta gcg gta aaa cgc atc ggt gac gaa acc ttc cgt tta tgc cag | 768 |
| | Gly Val Ala Val Lys Arg Ile Gly Asp Glu Thr Phe Arg Leu Cys Gln | |
| | 245 250 255 | |
| 45 | gag tat ctc gac gac atc atc acc gtc gat agc gat gcg atc tgt gcg | 816 |
| | Glu Tyr Leu Asp Ile Ile Thr Val Asp Ser Asp Ala Ile Cys Ala | |
| | 260 265 270 | |
| 50 | gcg atg aag gat tta ttc gaa gat gtg cgc gcg gtg gcg aaa ccc tct | 864 |
| | Ala Met Lys Asp Leu Phe Glu Asp Val Arg Ala Val Ala Lys Pro Ser | |
| | 275 280 285 | |
| 55 | ggc gcg ctg gcg ctg gcg gga atg aaa aaa tat atc gcc ctg cac aac | 912 |
| | Gly Ala Leu Ala Leu Ala Gly Met Lys Lys Tyr Ile Ala Leu His Asn | |
| | 290 295 300 | |
| 60 | att cgc ggc gaa cgg ctg gcg cat att ctt tcc ggt gcc aac gtg aac | 960 |
| | Ile Arg Gly Glu Arg Leu Ala His Ile Leu Ser Gly Ala Asn Val Asn | |
| | 305 310 315 320 | |
| 65 | ttc cac ggc ctg cgc tac gtc tca gaa cgc tgc gaa ctg ggc gaa cag | 1008 |
| | Phe His Gly Leu Arg Tyr Val Ser Glu Arg Cys Glu Leu Gly Glu Gln | |
| | 325 330 335 | |
| 70 | cgt gaa gcg ttg ttg gcg gtg acc att ccg gaa gaa aaa ggc agc ttc | 1056 |
| | Arg Glu Ala Leu Leu Ala Val Thr Ile Pro Glu Glu Lys Gly Ser Phe | |
| | 340 345 350 | |

| | | | | | | | | | | | | | | | | | |
|----|-------|------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| | ctc | aaa | ttc | tgc | caa | ctg | ctt | ggc | ggg | cgt | tcg | gtc | acc | gag | ttc | aac | 1104 |
| | Leu | Lys | Phe | Cys | Gln | Leu | Leu | Gly | Gly | Arg | Ser | Val | Thr | Glu | Phe | Asn | |
| | | | 355 | | | | | 360 | | | | | 365 | | | | |
| 5 | tac | cgt | ttt | gcc | gat | gcc | aaa | aac | gcc | tgc | atc | ttt | gtc | ggg | gtg | cgc | 1152 |
| | Tyr | Arg | Phe | Ala | Asp | Ala | Lys | Asn | Ala | Cys | Ile | Phe | Val | Gly | Val | Arg | |
| | | 370 | | | | | 375 | | | | | 380 | | | | | |
| 10 | ctg | agc | cgc | ggc | ctc | gaa | gag | cgc | aaa | gaa | att | ttg | cag | atg | ctc | aac | 1200 |
| | Leu | Ser | Arg | Gly | Leu | Glu | Glu | Arg | Lys | Glu | Ile | Leu | Gln | Met | Leu | Asn | |
| | | 385 | | | | 390 | | | | | 395 | | | | | 400 | |
| 15 | gac | ggc | ggc | tac | agc | gtg | gtt | gat | ctc | tcc | gac | gac | gaa | atg | gcg | aag | 1248 |
| | Asp | Gly | Gly | Tyr | Ser | Val | Val | Asp | Leu | Ser | Asp | Asp | Glu | Met | Ala | Lys | |
| | | | | 405 | | | | | | 410 | | | | | 415 | | |
| 20 | cta | cac | gtg | cgc | tat | atg | gtc | ggc | gga | cgt | cca | tcg | cat | ccg | ttg | cag | 1296 |
| | Leu | His | Val | Arg | Tyr | Met | Val | Gly | Gly | Arg | Pro | Ser | His | Pro | Leu | Gln | |
| | | | | 420 | | | | 425 | | | | | | 430 | | | |
| 25 | gaa | cgc | ctc | tac | agc | ttc | gaa | ttc | ccg | gaa | tca | ccg | ggc | gcg | ctg | ctg | 1344 |
| | Glu | Arg | Leu | Tyr | Ser | Phe | Glu | Phe | Pro | Glu | Ser | Pro | Gly | Ala | Leu | Leu | |
| | | | 435 | | | | | 440 | | | | | 445 | | | | |
| 30 | cgc | ttc | ctc | aac | acg | ctg | ggg | acg | tac | tgg | aac | att | tct | ttg | ttc | cac | 1392 |
| | Arg | Phe | Leu | Asn | Thr | Leu | Gly | Thr | Tyr | Trp | Asn | Ile | Ser | Leu | Phe | His | |
| | | 450 | | | | | 455 | | | | | 460 | | | | | |
| 35 | tat | cgc | agc | cat | ggc | acc | gac | tac | ggg | cgc | gta | ctg | gcg | gcg | ttc | gaa | 1440 |
| | Tyr | Arg | Ser | His | Gly | Thr | Asp | Tyr | Gly | Arg | Val | Leu | Ala | Ala | Phe | Glu | |
| | | 465 | | | | 470 | | | | | 475 | | | | | 480 | |
| 40 | ctt | ggc | gac | cat | gaa | ccg | gat | ttc | gaa | acc | cgg | ctg | aat | gag | ctg | ggc | 1488 |
| | Leu | Gly | Asp | His | Glu | Pro | Asp | Phe | Glu | Thr | Arg | Leu | Asn | Glu | Leu | Gly | |
| | | | | 485 | | | | | | 490 | | | | | 495 | | |
| 45 | tac | gat | tgc | cac | gac | gaa | acc | aat | aac | ccg | gcg | ttc | agg | ttc | ttt | ttg | 1536 |
| | Tyr | Asp | Cys | His | Asp | Glu | Thr | Asn | Asn | Pro | Ala | Phe | Arg | Phe | Phe | Leu | |
| | | | | 500 | | | | | 505 | | | | | 510 | | | |
| 50 | gcg | ggg | tag | | | | | | | | | | | | | | 1545 |
| | Ala | Gly | | | | | | | | | | | | | | | |
| 55 | <210> | 8 | | | | | | | | | | | | | | | |
| | <211> | 514 | | | | | | | | | | | | | | | |
| | <212> | PRT | | | | | | | | | | | | | | | |
| | <213> | Escherichia coli | | | | | | | | | | | | | | | |
| 60 | <400> | 8 | | | | | | | | | | | | | | | |
| | Met | Ala | Asp | Ser | Gln | Pro | Leu | Ser | Gly | Ala | Pro | Glu | Gly | Ala | Glu | Tyr | |
| | 1 | | | | 5 | | | | | 10 | | | | | 15 | | |
| 65 | Leu | Arg | Ala | Val | Leu | Arg | Ala | Pro | Val | Tyr | Glu | Ala | Ala | Gln | Val | Thr | |
| | | | 20 | | | | | | 25 | | | | | 30 | | | |
| 70 | Pro | Leu | Gln | Lys | Met | Glu | Lys | Leu | Ser | Ser | Arg | Leu | Asp | Asn | Val | Ile | |
| | | | 35 | | | | | 40 | | | | | 45 | | | | |
| 75 | Leu | Val | Lys | Arg | Glu | Asp | Arg | Gln | Pro | Val | His | Ser | Phe | Lys | Leu | Arg | |
| | | 50 | | | | | 55 | | | | | 60 | | | | | |

| | | | | | | | | | | | | | | | | | |
|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|
| | Gly | Ala | Tyr | Ala | Met | Met | Ala | Gly | Leu | Thr | Glu | Glu | Gln | Lys | Ala | His | |
| | 65 | | | | | 70 | | | | | 75 | | | | | 80 | |
| 5 | Gly | Val | Ile | Thr | Ala | Ser | Ala | Gly | Asn | His | Ala | Gln | Gly | Val | Ala | Phe | |
| | | | | | 85 | | | | | 90 | | | | | 95 | | |
| | Ser | Ser | Ala | Arg | Leu | Gly | Val | Lys | Ala | Leu | Ile | Val | Met | Pro | Thr | Ala | |
| | | | | 100 | | | | | 105 | | | | | 110 | | | |
| 10 | Thr | Ala | Asp | Ile | Lys | Val | Asp | Ala | Val | Arg | Gly | Phe | Gly | Gly | Glu | Val | |
| | | | 115 | | | | | 120 | | | | | 125 | | | | |
| | Leu | Leu | His | Gly | Ala | Asn | Phe | Asp | Glu | Ala | Lys | Ala | Lys | Ala | Ile | Glu | |
| 15 | | 130 | | | | | 135 | | | | | 140 | | | | | |
| | Leu | Ser | Gln | Gln | Gln | Gly | Phe | Thr | Trp | Val | Pro | Pro | Phe | Asp | His | Pro | |
| | 145 | | | | | 150 | | | | | 155 | | | | | 160 | |
| 20 | Met | Val | Ile | Ala | Gly | Gln | Gly | Thr | Leu | Ala | Leu | Glu | Leu | Leu | Gln | Gln | |
| | | | | | 165 | | | | | 170 | | | | | 175 | | |
| | Asp | Ala | His | Leu | Asp | Arg | Val | Phe | Val | Pro | Val | Gly | Gly | Gly | Gly | Leu | |
| 25 | | | | 180 | | | | | 185 | | | | | 190 | | | |
| | Ala | Ala | Gly | Val | Ala | Val | Leu | Ile | Lys | Gln | Leu | Met | Pro | Gln | Ile | Lys | |
| | | | 195 | | | | | 200 | | | | | 205 | | | | |
| 30 | Val | Ile | Ala | Val | Glu | Ala | Glu | Asp | Ser | Ala | Cys | Leu | Lys | Ala | Ala | Leu | |
| | | 210 | | | | | 215 | | | | | 220 | | | | | |
| | Asp | Ala | Gly | His | Pro | Val | Asp | Leu | Pro | Arg | Val | Gly | Leu | Phe | Ala | Glu | |
| 35 | | 225 | | | | 230 | | | | | 235 | | | | | 240 | |
| | Gly | Val | Ala | Val | Lys | Arg | Ile | Gly | Asp | Glu | Thr | Phe | Arg | Leu | Cys | Gln | |
| | | | | | 245 | | | | | 250 | | | | | 255 | | |
| 40 | Glu | Tyr | Leu | Asp | Asp | Ile | Ile | Thr | Val | Asp | Ser | Asp | Ala | Ile | Cys | Ala | |
| | | | 260 | | | | | | 265 | | | | | 270 | | | |
| | Ala | Met | Lys | Asp | Leu | Phe | Glu | Asp | Val | Arg | Ala | Val | Ala | Lys | Pro | Ser | |
| | | | 275 | | | | | 280 | | | | | 285 | | | | |
| 45 | Gly | Ala | Leu | Ala | Leu | Ala | Gly | Met | Lys | Lys | Tyr | Ile | Ala | Leu | His | Asn | |
| | | 290 | | | | | 295 | | | | | 300 | | | | | |
| | Ile | Arg | Gly | Glu | Arg | Leu | Ala | His | Ile | Leu | Ser | Gly | Ala | Asn | Val | Asn | |
| 50 | | 305 | | | | 310 | | | | | 315 | | | | | 320 | |
| | Phe | His | Gly | Leu | Arg | Tyr | Val | Ser | Glu | Arg | Cys | Glu | Leu | Gly | Glu | Gln | |
| | | | | | 325 | | | | | 330 | | | | | 335 | | |
| 55 | Arg | Glu | Ala | Leu | Leu | Ala | Val | Thr | Ile | Pro | Glu | Glu | Lys | Gly | Ser | Phe | |
| | | | | 340 | | | | | 345 | | | | | 350 | | | |
| | Leu | Lys | Phe | Cys | Gln | Leu | Leu | Gly | Gly | Arg | Ser | Val | Thr | Glu | Phe | Asn | |
| | | | 355 | | | | | 360 | | | | | 365 | | | | |
| 60 | Tyr | Arg | Phe | Ala | Asp | Ala | Lys | Asn | Ala | Cys | Ile | Phe | Val | Gly | Val | Arg | |
| | | 370 | | | | | 375 | | | | | | 380 | | | | |

| | | |
|----|--|-----|
| | Leu Ser Arg Gly Leu Glu Glu Arg Lys Glu Ile Leu Gln Met Leu Asn | |
| | 385 390 395 400 | |
| 5 | Asp Gly Gly Tyr Ser Val Val Asp Leu Ser Asp Asp Glu Met Ala Lys | |
| | 405 410 415 | |
| | Leu His Val Arg Tyr Met Val Gly Gly Arg Pro Ser His Pro Leu Gln | |
| | 420 425 430 | |
| 10 | Glu Arg Leu Tyr Ser Phe Glu Phe Pro Glu Ser Pro Gly Ala Leu Leu | |
| | 435 440 445 | |
| | Arg Phe Leu Asn Thr Leu Gly Thr Tyr Trp Asn Ile Ser Leu Phe His | |
| | 450 455 460 | |
| 15 | Tyr Arg Ser His Gly Thr Asp Tyr Gly Arg Val Leu Ala Ala Phe Glu | |
| | 465 470 475 480 | |
| 20 | Leu Gly Asp His Glu Pro Asp Phe Glu Thr Arg Leu Asn Glu Leu Gly | |
| | 485 490 495 | |
| | Tyr Asp Cys His Asp Glu Thr Asn Asn Pro Ala Phe Arg Phe Phe Leu | |
| | 500 505 510 | |
| 25 | Ala Gly | |
| | <210> 9 | |
| | <211> 1548 | |
| 30 | <212> DNA | |
| | <213> Escherichia coli | |
| | <220> | |
| 35 | <221> DNA | |
| | <222> (1)..(1548) | |
| | <223> | |
| 40 | <220> | |
| | <221> CDS | |
| | <222> (527)..(952) | |
| | <223> yjgF orf | |
| 45 | <400> 9 | |
| | tcgcatctg gtactgtaag gggaaataga gatgacacac gataataaat tgcaggttga | 60 |
| 50 | agctattaaa cgcggcacgg taattgacca tatccccgcc cagatcgggtt ttaagctggt | 120 |
| | gagtctgttc aagctgaccg aaacggatca gcgcacacacc attggtctga acctgccttc | 180 |
| | tggcgagatg ggccgcaaag atctgatcaa aatcgaaaat acctttttga gtgaagatca | 240 |
| 55 | agtagatcaa ctggcattgt atgcgccgca agccacgggtt aaccgtatcg acaactatga | 300 |
| | agtgggtgggt aaatcgcgcc caagtctgcc ggagcgcacg gacaatgtgc tggctctgcc | 360 |
| 60 | gaacagcaac tgtatcagcc atgccgaacc ggtttcatcc agctttgccc tgcgaaaacg | 420 |
| | cgccaatgat atcgcgctca aatgcaaata ctgtgaaaaa gagttttccc ataatgtggt | 480 |

| | | | | | | | | | | | | | | | | |
|----|--|------|--|--|--|--|--|--|--|--|--|--|--|--|--|-----|
| | gctggccaat taattgcggt tggtaataaa agtctggctc cctata atg agc cag | | | | | | | | | | | | | | | 535 |
| | Met Ser Gln | | | | | | | | | | | | | | | |
| | 1 | | | | | | | | | | | | | | | |
| 5 | act ttt tac cgc tgt aat aaa gga gaa atc atg agc aaa act atc gcg | 583 | | | | | | | | | | | | | | |
| | Thr Phe Tyr Arg Cys Asn Lys Gly Glu Ile Met Ser Lys Thr Ile Ala | | | | | | | | | | | | | | | |
| | 5 10 15 | | | | | | | | | | | | | | | |
| 10 | acg gaa aat gca ccg gca gct atc ggt cct tac gta cag ggc gtt gat | 631 | | | | | | | | | | | | | | |
| | Thr Glu Asn Ala Pro Ala Ala Ile Gly Pro Tyr Val Gln Gly Val Asp | | | | | | | | | | | | | | | |
| | 20 25 30 35 | | | | | | | | | | | | | | | |
| 15 | ctg ggc aat atg atc atc acc tcc ggt cag atc ccg gta aat ccg aaa | 679 | | | | | | | | | | | | | | |
| | Leu Gly Asn Met Ile Ile Thr Ser Gly Gln Ile Pro Val Asn Pro Lys | | | | | | | | | | | | | | | |
| | 40 45 50 | | | | | | | | | | | | | | | |
| 20 | acg ggc gaa gta ccg gca gac gtc gct gca cag gca cgt cag tgc ctg | 727 | | | | | | | | | | | | | | |
| | Thr Gly Glu Val Pro Ala Asp Val Ala Ala Gln Ala Arg Gln Ser Leu | | | | | | | | | | | | | | | |
| | 55 60 65 | | | | | | | | | | | | | | | |
| 25 | gat aac gta aaa gcg atc gtc gaa gcc gct ggc ctg aaa gtg ggc gac | 775 | | | | | | | | | | | | | | |
| | Asp Asn Val Lys Ala Ile Val Glu Ala Ala Gly Leu Lys Val Gly Asp | | | | | | | | | | | | | | | |
| | 70 75 80 | | | | | | | | | | | | | | | |
| 30 | atc gtt aaa act acc gtg ttt gta aaa gat ctg aac gac ttc gca acc | 823 | | | | | | | | | | | | | | |
| | Ile Val Lys Thr Thr Val Phe Val Lys Asp Leu Asn Asp Phe Ala Thr | | | | | | | | | | | | | | | |
| | 85 90 95 | | | | | | | | | | | | | | | |
| 35 | gta aac gcc act tac gaa gcc ttc ttc acc gaa cac aac gcc acc ttc | 871 | | | | | | | | | | | | | | |
| | Val Asn Ala Thr Tyr Glu Ala Phe Phe Thr Glu His Asn Ala Thr Phe | | | | | | | | | | | | | | | |
| | 100 105 110 115 | | | | | | | | | | | | | | | |
| 40 | ccg gca cgt tct tgc gtt gaa gtt gcc cgt ctg ccg aaa gac gtg aag | 919 | | | | | | | | | | | | | | |
| | Pro Ala Arg Ser Cys Val Glu Val Ala Arg Leu Pro Lys Asp Val Lys | | | | | | | | | | | | | | | |
| | 120 125 130 | | | | | | | | | | | | | | | |
| 45 | att gag atc gaa gcg atc gct gtt cgt cgc taa tcttgatgga aatccgggct | 972 | | | | | | | | | | | | | | |
| | Ile Glu Ile Glu Ala Ile Ala Val Arg Arg | | | | | | | | | | | | | | | |
| | 135 140 | | | | | | | | | | | | | | | |
| 50 | atcatgcccg gattaagtct gatgacaaac gcaaaatcgc ctgatgcgct acgcttatca | 1032 | | | | | | | | | | | | | | |
| | ggcctacgtg attcctgcaa tttattgaat ttgttggccg gataaggcat ttacgccgca | 1092 | | | | | | | | | | | | | | |
| 55 | tccggcatga acaaaaactca ctttgtctac aatctgaatc ggggctatcg tgcccagttt | 1152 | | | | | | | | | | | | | | |
| | attctttatt gccagccgta acgacggcta tagaaccctt tcaccaactg ggttaatgtc | 1212 | | | | | | | | | | | | | | |
| | atataccctg ccagaatcgc aaccagccac gggaaatagc ttaacggcag cgctgtgaat | 1272 | | | | | | | | | | | | | | |
| 60 | tgcagataac tggccagcgg tgaaaacggc aatgcgatcc cgacaatcat cacgatcacg | 1332 | | | | | | | | | | | | | | |
| | gtcatgatca ttaacggcca cgatgcacag ctctgaataa acggcacacg gcgggtgcgg | 1392 | | | | | | | | | | | | | | |
| 65 | atcatatgca caatcagcgt ttgcgacagt aagcccacca caaaccatcc cgactggaac | 1452 | | | | | | | | | | | | | | |
| | agcgttttgcg tttccggcgt gttggcatgg aatacccacc acatcaggca aaacgtcaaa | 1512 | | | | | | | | | | | | | | |
| 70 | atatcgaaga tcgagctgat cgggtccgaag aagatc | 1548 | | | | | | | | | | | | | | |

15

<210> 10
 <211> 141
 <212> PRT
 <213> Escherichia coli

5

<400> 10

| | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Met | Ser | Gln | Thr | Phe | Tyr | Arg | Cys | Asn | Lys | Gly | Glu | Ile | Met | Ser | Lys |
| 1 | | | | 5 | | | | | 10 | | | | | 15 | |
| Thr | Ile | Ala | Thr | Glu | Asn | Ala | Pro | Ala | Ala | Ile | Gly | Pro | Tyr | Val | Gln |
| | | | 20 | | | | 25 | | | | | | 30 | | |
| Gly | Val | Asp | Leu | Gly | Asn | Met | Ile | Ile | Thr | Ser | Gly | Gln | Ile | Pro | Val |
| | | 35 | | | | | 40 | | | | | 45 | | | |
| Asn | Pro | Lys | Thr | Gly | Glu | Val | Pro | Ala | Asp | Val | Ala | Ala | Gln | Ala | Arg |
| | 50 | | | | | 55 | | | | | 60 | | | | |
| Gln | Ser | Leu | Asp | Asn | Val | Lys | Ala | Ile | Val | Glu | Ala | Ala | Gly | Leu | Lys |
| 65 | | | | 70 | | | | | | 75 | | | | | 80 |
| Val | Gly | Asp | Ile | Val | Lys | Thr | Thr | Val | Phe | Val | Lys | Asp | Leu | Asn | Asp |
| | | | 85 | | | | | | 90 | | | | | 95 | |
| Phe | Ala | Thr | Val | Asn | Ala | Thr | Tyr | Glu | Ala | Phe | Phe | Thr | Glu | His | Asn |
| | | | 100 | | | | | 105 | | | | | 110 | | |
| Ala | Thr | Phe | Pro | Ala | Arg | Ser | Cys | Val | Glu | Val | Ala | Arg | Leu | Pro | Lys |
| | | 115 | | | | | 120 | | | | | 125 | | | |
| Asp | Val | Lys | Ile | Glu | Ile | Glu | Ala | Ile | Ala | Val | Arg | Arg | | | |
| | 130 | | | | | 135 | | | | | | 140 | | | |